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IR TECHNICAL INTELLIGENCE STUDY

NO. 102-AC-52/14-34

(RESTRICTED)

SOVIET
OPERATIONAL INTERCEPTOR AIRCRAFT

3 SEPTEMBER 1952

PROJECT NO. 9995

AIR TECHNICAL INTELLIGENCE CENTER
WRIGHT-PATTERSON AIR FORCE BASE
OHIO

SECRET

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SOVIET OPERATIONAL INTERCEPTOR AIRCRAFT

Purpose

The purpose of this report is to present and evaluate the technical capabilities of operational Soviet interceptor aircraft.

Factual Data

1. Two versions of the MIG-15 plus the Type-28 constitute those Soviet aircraft types which from the performance standpoint, can adequately fulfill an interceptor mission.

2. All known Soviet fighter aircraft observed to date have been designed primarily as interceptors.

3. The MIG-15 was first observed during the 1948 July air show and since 1949 has become fully operational. The Type-28 was first observed during the July air show of 1948 and is now considered to be operational.

4. The MIG-15 has been observed in the forward areas of Soviet influence.

Discussion

In considering present Soviet interceptor capabilities it is necessary to consider the MIG-15 and the Type-28 (see Table 1). Although older Soviet fighters, such as the Yak-15, Type-16, and MIG-9, were originally designed as interceptors, their relatively poor altitude performance precludes their use in such a role against high-altitude bombers now being developed.

Soviet interceptors equipped with two 23 mm NS automatic guns are considered to be inadequately armed in view of the performance of these weapons and their ammunition. Technical evaluation of the gun and ammunition produced an estimated performance of 525-575 rounds per minute at approximately 2500 feet per second. Two of these weapons delivering approximately 1100 rounds per minute will seriously penalize the probability of obtaining hits at extended ranges beyond 800 yards, when compared with current and future fighters in Western airpowers which have a delivery rate of 3000 rounds per minute and upwards, of 20 mm ammunition at higher muzzle velocities. Investigation of the lethal effect of Soviet 23 mm ammunition indicates that it does not greatly surpass the 20 mm projectiles in use at the present time. The addition of a 37 mm N gun to the weapon systems adds little, approximately 450 rounds per minute at 2400 feet per second, to the delivered rate of fire. Although the 37 mm HE shell is capable of extensive damage, the effectiveness of the 37 mm gun is diminished by the current practice of linking armor piercing and air-burst high-explosive ammunition which have a low single shot probability of kill. Employment of these large rounds, 23 and 37 mm, restricts the amount of ammunition which may be

carried within the space and weight allowance for armament and consequently results in a short duration of fire power of relatively low density. Hence, the effectiveness of these weapon systems is restricted to attacks on B-29 type aircraft at short ranges.

Any of these aircraft would be capable of carrying one or two air-to-air guided missiles. However, there is no evidence of any current Soviet development in the field of air-to-air guided missiles.

The Type-28 is a relatively small straight-wing aircraft with an estimated gross weight of 8300 lbs. The aircraft is believed to be powered by a Soviet copy of the British Derwent engine which is identified as the Soviet RD-500 engine. Performance of this aircraft (see Figure 1) is not outstanding; however, it would be adequate against present day bombers. Based on the estimated installation of two 23 mm guns, the comparatively low fire power would limit the Type-28's effectiveness.

The MIG-15, which is the backbone of the Soviet interceptor force, is an aerodynamically clean aircraft with swept-back wings and tail surfaces. A large vertical tail is swept-backward at an angle of 60 degrees overhanging the exhaust outlet. The swept horizontal tail reflects German design influence, being mounted high on the vertical tail. Two airflow control strips are mounted on each wing.

The early version of the MIG-15 is powered by a Soviet version of the British Nene (Soviet designation is RD-45), which is rated at 5000 lbs thrust. Performance (see Figure 2) of this swept-wing aircraft is very good and would enable the aircraft to intercept any of the modern high speed bombers, although its effectiveness would be limited by its low fire power. The lack of AI equipment severely limits the use of the MIG-15 as an all-weather or night fighter.

The most advanced interceptor aircraft now operational in the Soviet Union is the version of the MIG-15 (see Figure 3) employing a VK-1 power plant. The VK-1 is an improved version of the Soviet RD-45 and is rated at approximately 6000 lbs thrust. The VK-1 version of the MIG-15 is estimated to have a gross weight of 11,000 lbs and is estimated to have a sea level rate of climb of approximately 10,800 ft per minute. The extremely high combat ceiling of 52,500 ft makes this version of the MIG-15 an excellent interceptor, capable of intercepting any of the modern high speed bombers. With military power and a combat gross weight of approximately 9600 lbs, the aircraft is considered to be capable of approximately 2 g's in a level turn at 40,000 ft. The aircraft is estimated to have a maximum rate of level turn of 4.5 degrees per second with a radius of level turn of 2700 yards at a Mach number of .66. The estimated time required for the interceptor to make a 360 degree turn in positioning for successive passes will be about 80 seconds. The time required for a 180 degree turn will be approximately one-half that period. The penetration range of the attacking bomber between successive passes is virtually dependent upon the closure rate of

the interceptor in a stern chase, together with the turning time required. Actual solution of such a problem is primarily an operational consideration. Present indications are that a modern jet bomber will penetrate approximately five times the distance of a modern reciprocating bomber, between successive passes with an airplane of the MIG-15 class. From the standpoint of maneuverability at high altitude, the MIG-15 airplane possesses excellent characteristics. The lack of AI equipment and the low fire power will be an important determinant in the overall effectiveness of the airplane.

The MIG-15 aircraft is currently being utilized in many fighter units and is in widespread use in Korea. For the next two or three years the MIG-15 is expected to be the backbone of the Soviet interceptor force.

The MIG-15 performance cannot be substantially improved without a complete redesign of the aircraft. The incorporation of a short afterburner would require an extensive redesign of the aft section of the fuselage, and would give only a small increase in speed. Such a redesign would result in a substantial decrease in the MIG-15 combat range and radius. A complete redesign of the aircraft would be necessary to supply adequate fuel space for satisfactory endurance.

As a "last ditch stand" where the interceptor is not expected to return, the MIG-15 would be capable of obtaining combat ceiling of approximately 55,000 ft. This could be accomplished without stripping the aircraft. The MIG could take off with only 50 percent fuel load and have approximately 40 gallons of fuel left to position and complete one firing pass, or a ramming run.

In the near future any Soviet day interceptors, if developed, are expected to be cleaned up versions of the MIG-15. Such fighters will probably utilize a high thrust axial flow engine. An auxiliary liquid rocket unit and/or jet engine thrust augmentation may be incorporated for improved climb performance or short bursts of speed at altitude. If a new day fighter is developed, it is expected to have a maximum speed in the order of Mach number 1, and a service ceiling in excess of 55,000 ft.

It is believed that due to space requirements a twin-jet configuration offers the most promise for future Soviet all-weather fighter development. The twin-jet configuration would allow ample space for equipment, fuel, and personnel.

Utilization by the Soviets of a small relatively short range aircraft, utilizing a comparatively high thrust engine, has enabled the Soviets to design an excellent performing high altitude interceptor. The addition of AI equipment and armament of a greater fire power to any of these designs would make them serve adequately as all-weather interceptors. Since, from the performance standpoint, the MIG-15 has been a success as a day interceptor, it is doubtful that the Soviets will build and produce another pure day interceptor.

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Conclusions

1. Based on experience of the Western airpowers, the present fire power of Soviet interceptors is not adequate for high kill probability against high speed bomber aircraft, e.g., B-47 and B-57 categories.

2. The MIG-15 is considered to be a good high altitude day interceptor. These aircraft are estimated to possess good maneuverability characteristics at high altitudes. However, the lack of airborne electronic equipment and the low fire power limit the effectiveness of the aircraft as an all-weather interceptor.

3. The Type-28 is not outstanding as an interceptor; however, performance-wise it would prove adequate against present day operational bombers in the B-29 or even B-36 categories.

4. At present (January 1953) there is no indication that either of the MIG-15 versions or the Type-28 incorporate thrust augmentation of any sort.

5. Optimum Soviet interceptor capability is exhibited by the MIG-15 with the VK-1 engine installed. Some important performance items are listed as follows for military power and a gross weight of 11,000 lbs:

a.	Rate of climb at sea level	10,800 fpm
b.	Time to climb to 45,000 ft	8.2 minutes
c.	Maximum speed at sea level	582 knots
d.	Maximum speed at 45,000 ft	510 knots

TABLE 1

SOVIET INTERCEPTOR AIRCRAFT

Model	MIG-15	MIG-15	Type-28
Manufacturer	Mikoyan & Gurevich	Mikoyan & Gurevich	Yakovlev
Status	Production	Production	Production
First flight	1948	?	1948*
Available	1949	?	?
Lead time	6-12 months	**	12 months ?
Crew	1	1	1
Power plant	1 x RD-45	1 x VK-1	1 x RD-500
Armament:			
Guns	2 x 23 mm 1 x 37 mm	2 x 23 mm 1 x 37 mm	2 x 23 mm ?
Rounds per gun	80 40	80 40	?
Rockets	May be carried		?
Guided missiles	?	?	?
Fire control	?	?	Unknown
Performance:			
Time to climb to combat altitude	6.1/35,000	4.4/35,000	6.7/35,000
Combat speed/combat altitude	530/35,000	535/35,000	455/35,000
Combat radius/average speed	160/435	160/466	220/408
Duration of mission	66	61	85
Combat ceiling (Combat weight, 500 fpm climb)	49,000	53,500	50,000
Take-off weight	10,800	11,000	8,300
Remarks	Daylight, high altitude interceptor		

* Aircraft was first observed in operational numbers in 1951; however, it is believed to have flown in the 1948 air show.
** Probably only involved a change in engine installed.

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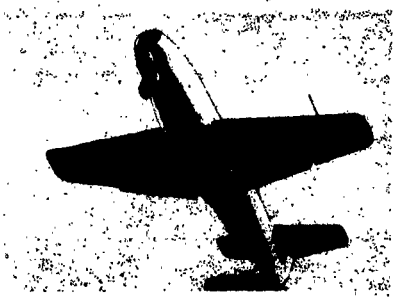
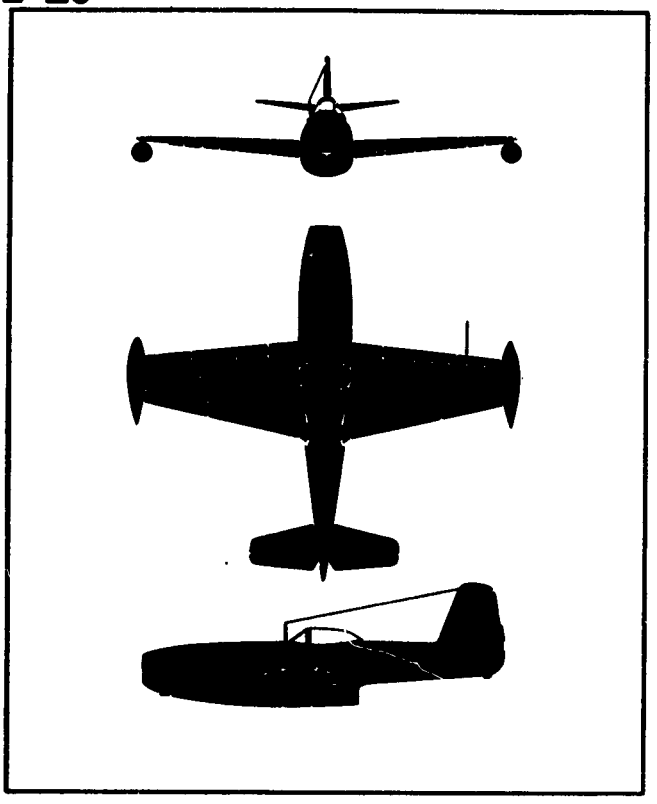
TYPE-28





BASIC DATA

POWER UNIT	RD-500 (3500 lb. T.)			
PROPELLER				
EXT. FUEL CAP. (GALS)	83	IMP.	100	U.S.
INT. FUEL CAP. (GALS)	208	IMP.	250	U.S.
TAKE OFF DISTANCE			2300	FT.

WING SPAN	28	FT.	6	IN.
OVERALL LENGTH	27	FT.	2	IN.
HEIGHT		FT.		IN.
WING AREA			161	SQ.FT.
TAKE OFF WEIGHT			8300	LB.

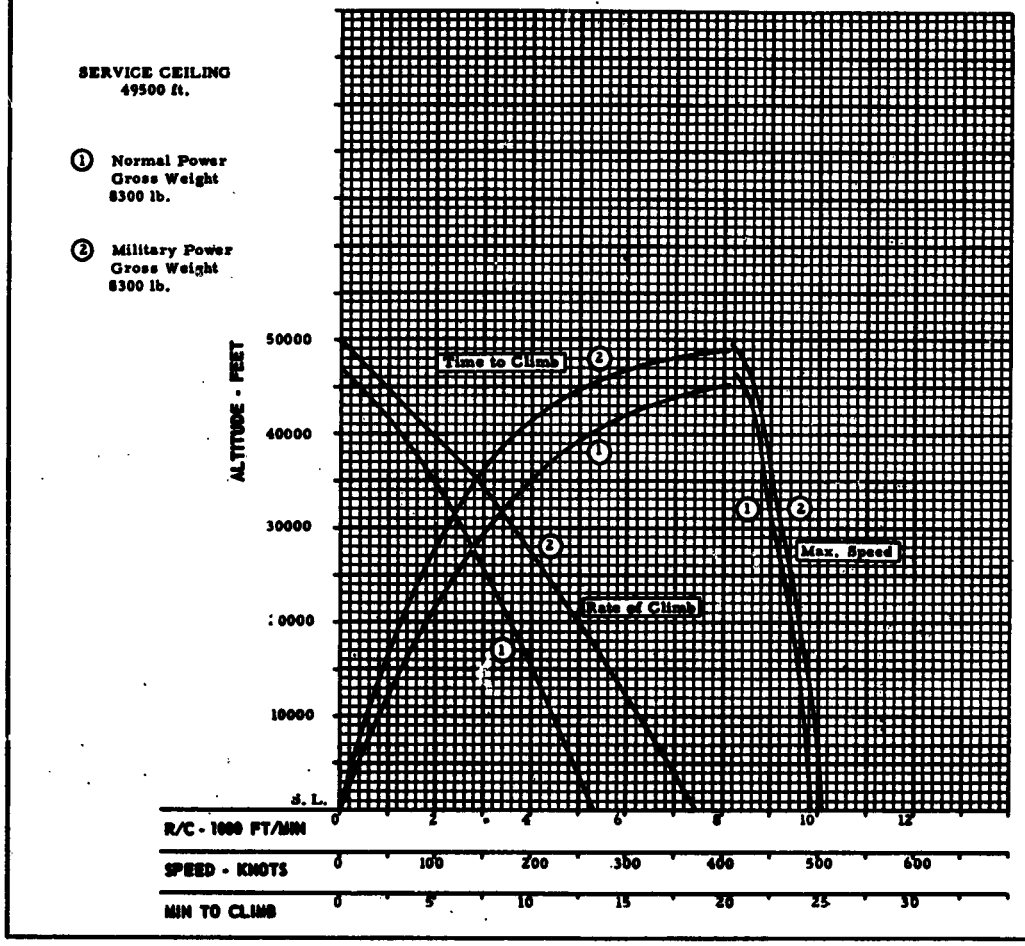
GENERAL INFORMATION

Crew - One

Designer thought to be Yakovlev and is possibly designated Yak-23.

The Type 28 has been observed in the satellite countries since 1951.

TYPE-28



COMBAT RANGE / RADIUS (U.S.)			
NAUTICAL MILES	640/220	960/385	
CRUISE SPEED (KN.)	408	408	
ALTITUDE (FT.)	37500/50000	46/49500	
FUEL (U.S. GALS.)	250	350	
BOMB LOAD (LB.)	0	0	
TAKE OFF WEIGHT (LB.)	8300	9100	

STILL AIR RANGE (U.K.)			
NAUTICAL MILES	720	1070	
CRUISE SPEED (KN.)	408	408	
ALTITUDE (FT.)	37500/50000	46/49500	
FUEL (IMP. GALS.)	208	290	
BOMB LOAD (LB.)	0	0	
TAKE OFF WEIGHT (LB.)	8300	9100	

ARMAMENT

NO.	CALIBRE	R P G	LOCATION
2	23 mm	80	Lower fuselage nose.

BOMB / FREIGHT LOAD

NORMAL LOAD LB.
MAXIMUM LOAD LB.
STOWAGE:

RADIO EQUIPMENT

NAVIGATION EQUIPMENT

PASSIVE PROTECTION

OTHER EQUIPMENT

Fig. 1 (Contd)

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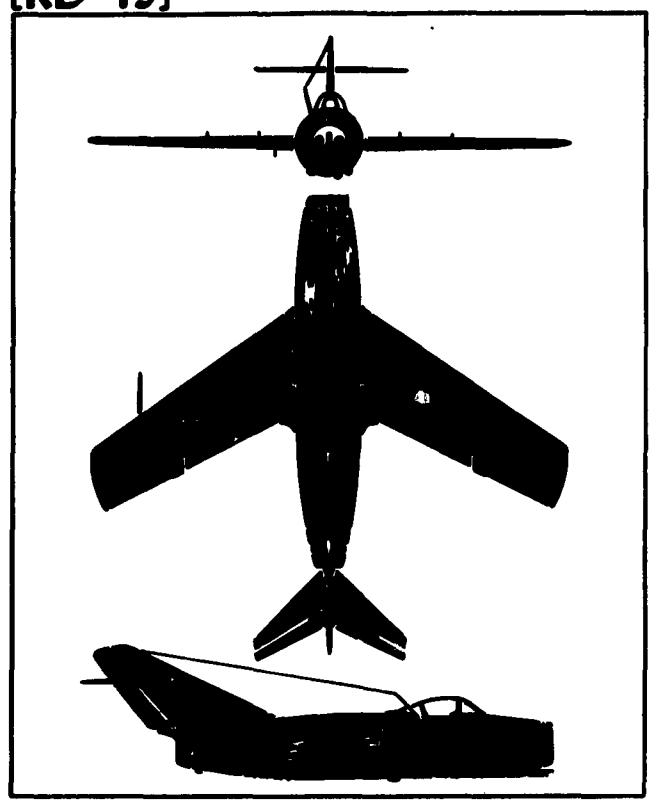
MIG-15 [RD-45]



BASIC DATA

POWER UNIT	RD-45 (5000 lb. T.)				WING SPAN	33 FT.	0 IN.
PROPELLER					OVERALL LENGTH	33 FT.	7 IN.
EXT. FUEL CAP. (GALS)	116	IMP.	140	U.S.	HEIGHT	10 FT.	10 IN.
INT. FUEL CAP. (GALS)	274	IMP.	330	U.S.	WING AREA	218	SQ.FT.
TAKE OFF DISTANCE	2970			FT.	TAKE OFF WEIGHT	10800	LB.

GENERAL INFORMATION

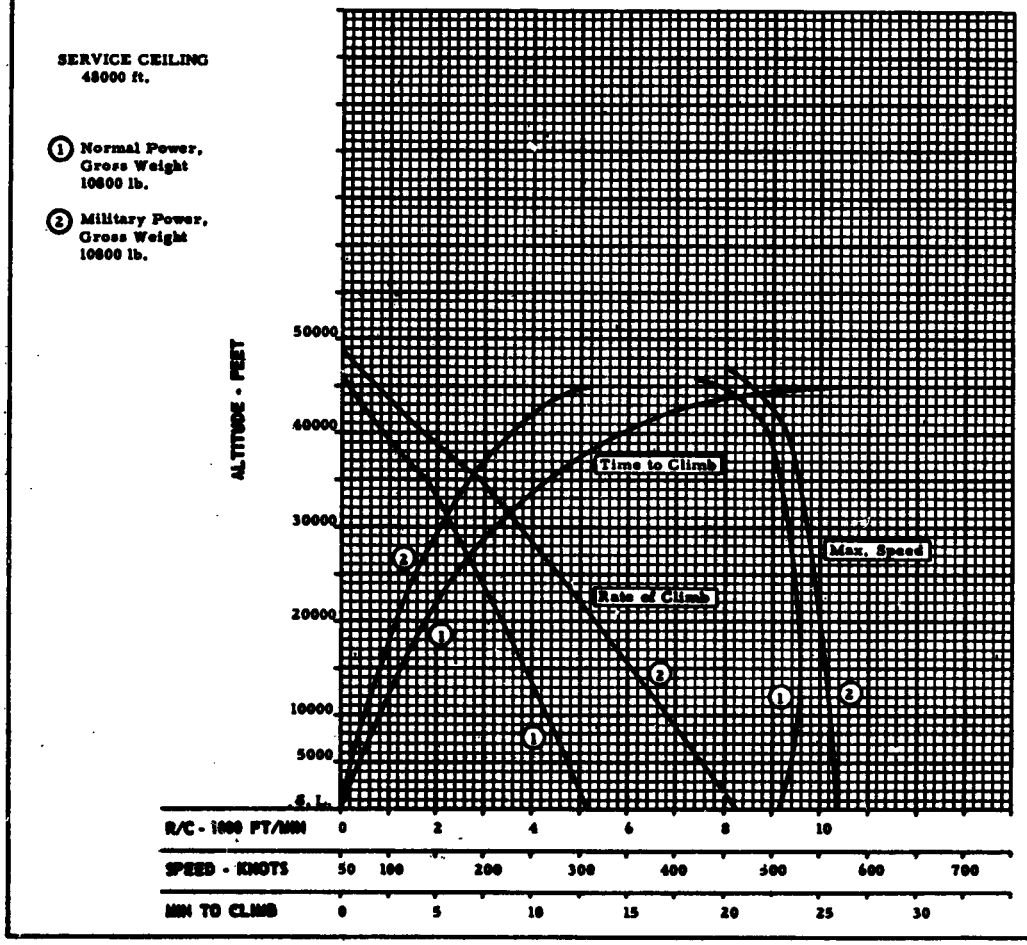
Crew - One

Designed by the team Mikoyan and Gurevich, the Mig-15 was first seen in 1948 and came into squadron service in 1949.

When external tanks of 70 U.S./58 IMP gallons each are fitted, the take-off weight of the aircraft is increased to 11890 lb. The maximum speed is then decreased by approximately 10 knots.

The capacity of the external fuel tanks allows enough fuel for warm-up, taxi, take-off and initial climb. Tanks are jettisoned at approximately 40000 ft. This allows the aircraft to fly the remainder of its mission in a clean condition. This procedure results in a substantial increase in range with no sacrifice in performance.

MIG-15 [RD 45]



COMBAT RANGE / RADIUS (U.S.)			
NAUTICAL MILES	560/160	860/310	
CRUISE SPEED (KN.)	435	440	
ALTITUDE (FT.)	45000	40000	
FUEL (U.S. GALS.)	330	470	
BOMB LOAD (LB.)	0	0	
TAKE OFF WEIGHT (LB.)	10600	11890	

STILL AIR RANGE (U.K.)			
NAUTICAL MILES	625	950	
CRUISE SPEED (KN.)	435	440	
ALTITUDE (FT.)	45000	40000	
FUEL (IMP. GALS.)	274	390	
BOMB LOAD (LB.)	0	0	
TAKE OFF WEIGHT (LB.)	10600	11890	

ARMAMENT

NO.	CALIBRE	R P G	LOCATION
1	37 mm	40	Lower fuselage nose.
2	23 mm	60-80	Lower Fuselage nose.

BOMB / FREIGHT LOAD

NORMAL LOAD LB.
MAXIMUM LOAD 2 x FAB 250 (550 lb. each) LB.
STOWAGE: On wing shackles

RADIO EQUIPMENT

HF Comm. Receiver RSI-6M-1
Homing Receiver RPKO-10M

NAVIGATION EQUIPMENT

RPKO-10M Homing and Comm. Receiver

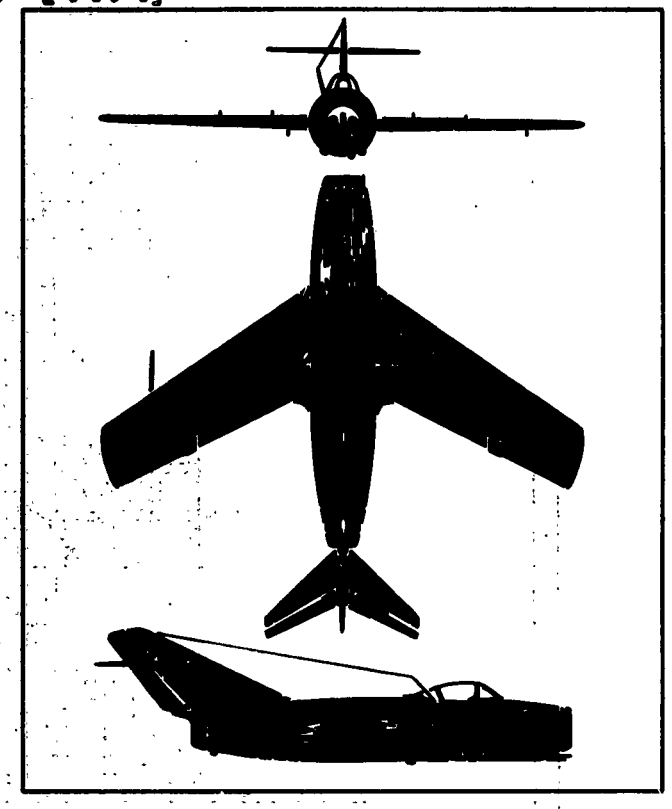
PASSIVE PROTECTION

Bullet proof windshield.
Plate at back of pilot.

OTHER EQUIPMENT

Fig. 2 (Contd)

MIG-15 [VK-1]



BASIC DATA

POWER UNIT	VK-1 (6000 lb. T.)			
PROPELLER				
EXT. FUEL CAP. (GALS)	116	IMP.	140	U.S.
INT. FUEL CAP. (GALS)	274	IMP.	330	U.S.
TAKE-OFF DISTANCE	2590			FT.

WING SPAN	33 FT.	0 IN.
OVERALL LENGTH	33 FT.	7 IN.
HEIGHT	10 FT.	10 IN.
WING AREA	218	SQ.FT.
TAKE OFF WEIGHT	11000	LB.

GENERAL INFORMATION

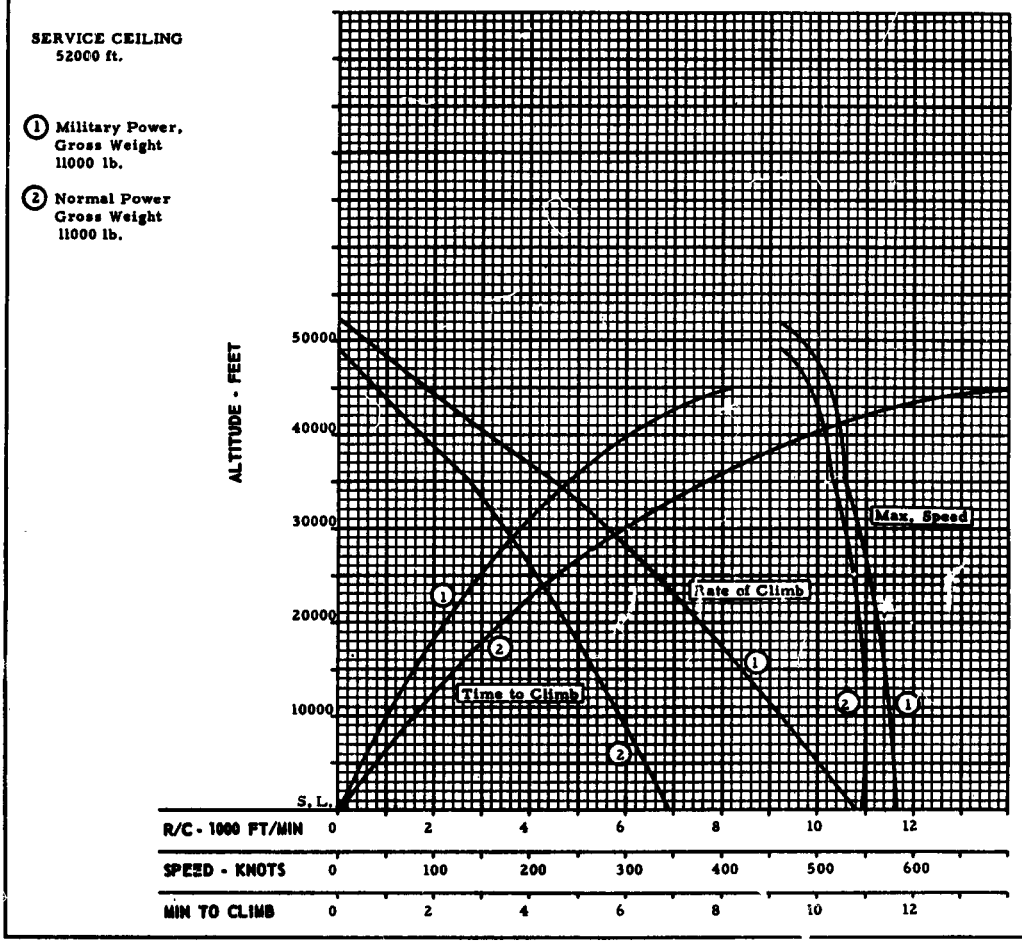
Crew - One

The acquisition of part of a crashed Mig-15 during April 1951 gave the first firm information of the existence of an improved Mig-15. Examination of available parts indicates that this aircraft is identical in size to the original Mig-15 and that the engine is an improved Soviet RD-45 designated VK-1 capable of 6000 lb thrust at the static sea level condition.

When external tanks of 70 US/58 IMP gallons each are fitted, the take-off weight of the aircraft is increased to 12090 lb. The maximum speed is then decreased by approximately 10 knots.

The capacity of the external fuel tanks allows enough fuel for warm-up, taxi, take-off and initial climb. Tanks are jettisoned at approximately 40000 feet thus allowing the aircraft to fly the remainder of its mission in a clean condition. This procedure results in a substantial increase in range with no sacrifice in performance.

MIG-15 [VK I]



COMBAT RANGE / RADIUS [U.S.]			
NAUTICAL MILES	540/160	340/315	
CRUISE SPEED (KM.)	466	470	
ALTITUDE (FT.)	49/52000	47/51000	
FUEL (U.S. GALS.)	330	470	
BOMB LOAD (LB.)	0	0	
TAKE OFF WEIGHT (LB.)	11000	12090	

STILL AIR RANGE [U.K.]			
NAUTICAL MILES	600	935	
CRUISE SPEED (KM.)	466	470	
ALTITUDE (FT.)	49/52000	47/51000	
FUEL (IMP. GALS.)	274	391	
BOMB LOAD (LB.)	0	0	
TAKE OFF WEIGHT (LB.)	11000	12090	

ARMAMENT

NO.	CALIBRE	R P G	LOCATION
1	37 mm	40	Lower fuselage nose
2	23 mm	60-80	Lower fuselage nose.

BOMB / FREIGHT LOAD

NORMAL LOAD		LB.
MAXIMUM LOAD	2 x FAB 250 (550 lb each)	LB.
STOWAGE:	On wing shackles	

RADIO EQUIPMENT

HF Comm. Receiver RSI-6M-1
Homing Receiver RPKO-10M

NAVIGATION EQUIPMENT

RPKO-10M Homing and Comm. Receiver

PASSIVE PROTECTION

Bullet proof windshield
Plate at back of pilot.

OTHER EQUIPMENT

Fig. 3 (Contd)

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EADF	1	12th AF, A-2	8
FEAF Intell Div	5	FEAMC	1
3rd AF	3	ATIA	1
USFA	2	ATIX	1
WADF	1	ATISD-3	1
4 AF	1	ATISE-1	1
Av Eng Force	1	ATIAA	4
1142nd USAF Sp. Act. Sqd.	1	Aberdeen Pvg Grd	1
AA Ankara, Turkey	1	Air Weapons Rsch Cen.	1
AA London, England	1	WCOSI	1
AA Paris, France	1	WCOE	1
AA Rome, Italy	1	WCOW	1
AA Stockholm, Sweden	1	WCOWP	1
AA Bern, Switzerland	1	WCLO	1
RADC	1	WCLEE	1
Edwards AFB	4	WCLPP	1
Arnold Eng Dev Cen	1	WCLSO	2
Patrick AFB	1	WCRO	1
6540th AFMTW Holloman AFB	1	WCTE	1
AU	3	USAF AGOS-Librarian	1
Asst C/S, G-2	16	Hq USAFSS-Arlington	1
9th AF	2	ATIRC-1	1

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